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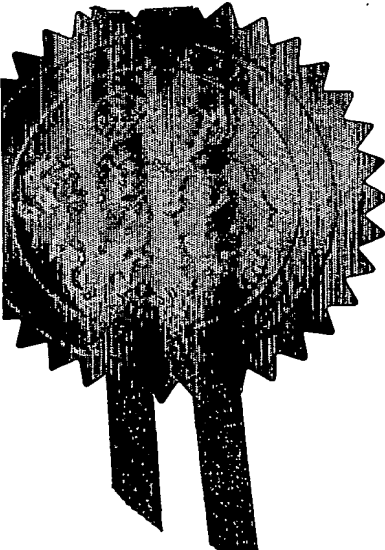
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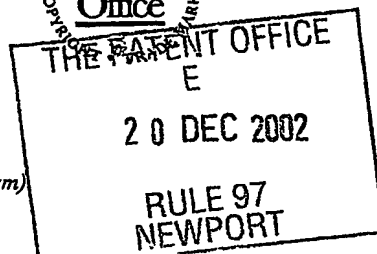
W. Evans

Dated

23 June 2004

Patents Form 1/77

Patents Act 1977
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1/77

Request for grant of a patent

(See the notes on the back of this form. You can also get and explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
NEWPORT
South Wales
NP10 8QQ

1. Your reference

P1080.GBA

2. Patent application number

0229952.7

20 DEC 2002

(The Patent Office will fill in this part)

3. Full name, address and postcode of the or of each applicant. (underline all surnames)

Newlands Technology Limited
Unit 3F Newlands Science Park
Inglemire Lane
HULL
HU6 7TQ

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

07 857451002

4. Title of the invention

MAGNETOSTRICTIVE ACTUATOR

5. Name of your agent (if you have one)

LOVEN & CO

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

Quantum House
30 Tentercroft Street
LINCOLN
LN5 7DB

Patents ADP number (if you know it)

4467460003 ✓

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

Yes

- (a) any applicant named in part 3 is not an inventor, or
 - (b) there is an inventor who is not named as an applicant, or
 - (c) any named applicant is a corporate body
- See note (d))

Patents Form 1/77

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Continuation sheets of this form 0

Description 3

Claim(s)

Abstract

Drawing(s) 4

10. If you are also filing any of the following, state how many against each item.

Priority documents

Translations of priority documents

Statement of inventorship and right to grant of a patent (Patents Form 7/77)

Request for preliminary examination and search (Patents Form 9/77)

Request for substantive examination (Patents Form 10/77)

Any other documents (please specify)

11. I/We request the grant of a patent on the basis of this application.

Signature

Date 19 December 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

K J Loven (01522 801111)

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Notes

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Magnetostrictive Actuator

Field of the Invention

This relates to obtaining broad frequency bandwidth from actuators.

Background to the Invention

5 Audio actuators of different construction produce different frequency bandwidths. Broader bandwidth has been achieved by having a variety of different actuators each driving a surface, or the same surface, separately. This invention describes different methods of combining features of different constructions within a single actuator to achieve broader bandwidth, and so reducing the overall cost of manufacture and installation. It is
10 also known to combine different materials in a single actuator, for example piezo and magnetostrictive to create a specific output of force and frequency for a particular application.

 In a magnetostrictive actuator it is well known that the design of the coil and size of the magnetostrictive piece of material determines the frequency response and volume
15 output of the actuator on any surface. It is also well known that actuators can be constructed with a single stack of coils with magnets between the coils in the stack.

Summary of the Invention

 According to this invention it has been found that if the coils within the stack are of different specification, for example by varying the number of turns or the thickness of
20 the wire or the resistivity of the wire, then the output of the actuator will combine the frequency responses as if the different coils were in separate actuators.

 One aspect of the invention therefore provides a magnetostrictive actuator comprising a magnetostrictive element under the influence of a plurality of stacked electromagnetic coils, each coil in the stack being constructed to have a different frequency response from the other coils in the stack, the coils being excited at the same time, whereby
25 the actuator exhibits a greater frequency bandwidth than if the stacked coils were all of the same specification.

 This output can then be varied by a number of means to emphasise different parts of the frequency spectrum according to the output desired. For example a potentiometer
30 can be connected across the 2 coils as in Fig 1 to vary the current to each coil, or potenti-

ometers can be connected to each coil so that instead of changing the balance between the coils as in Fig 1, each coil can be varied independently as in Fig 2 and Fig 3. The setting of the potentiometers may be fixed at manufacture or may be variable so that it is accessible to the user and would be used in the same way as a tone control in a conven-

5 tional amplifier/speaker arrangement.

The coils may be wound on separate bobbins or wound on the same bobbin. If wound on the same bobbin they may be coaxially wound, or wound in separate layers or at different ends of the bobbin.

10 Another variable that can be used to change the frequency response of an actuator is to vary the dimensions of the magnetostrictive material or to vary the composition of the magnetostrictive material, and to have different dimensions of material, or different magnetostrictive materials as well as different coils in each part of a combined actuator. The coils and drive elements may be configured side by side as in fig 7 or stacked on top of one another in the more usual arrangement.

15 Another variable is to have a combined flextensional and direct drive actuator as in fig 4, fig 5, fig 6 with the coils and dimensions of the magnetostrictive materials being chosen according to the output desired. It has been found that the configuration in fig 4 is most advantageous but in another configuration fig 5 the direct drive element could be on top of the flextensional drive element or the drive elements could be side by side fig 6.

20 A two-unit actuator could have controls for, for example bass and treble, and a three-unit actuator controls for bass, mid-range and treble. Further combinations and numbers of separate units within the same actuator are possible.

In the drawings, the following reference numerals are used to identify the components indicated:

- 25 10, 20 Screw/Hard Bond Connection
11, 21 Enclosure/Mass
12, 22 Flextensional Prestress element
13, 23 Horizontal Active Element
14, 24 Direct Drive Actuator
30 15, 25 Vertical Active Element

	30	Screw/Hard Bond Connection
	31	Enclosure/Mass
	32	Direct Drive Unit
	33	Direct Vertical Active Element
5	34	Flextensional Prestress Element
	35	Horizontal Active Element
	36	Foot
	40	Screw/Hard Bond Connection
	41	Enclosure/Mass
10	42	Direct Drive Unit
	43	Direct Vertical Active Element
	44	Foot

Fig 1

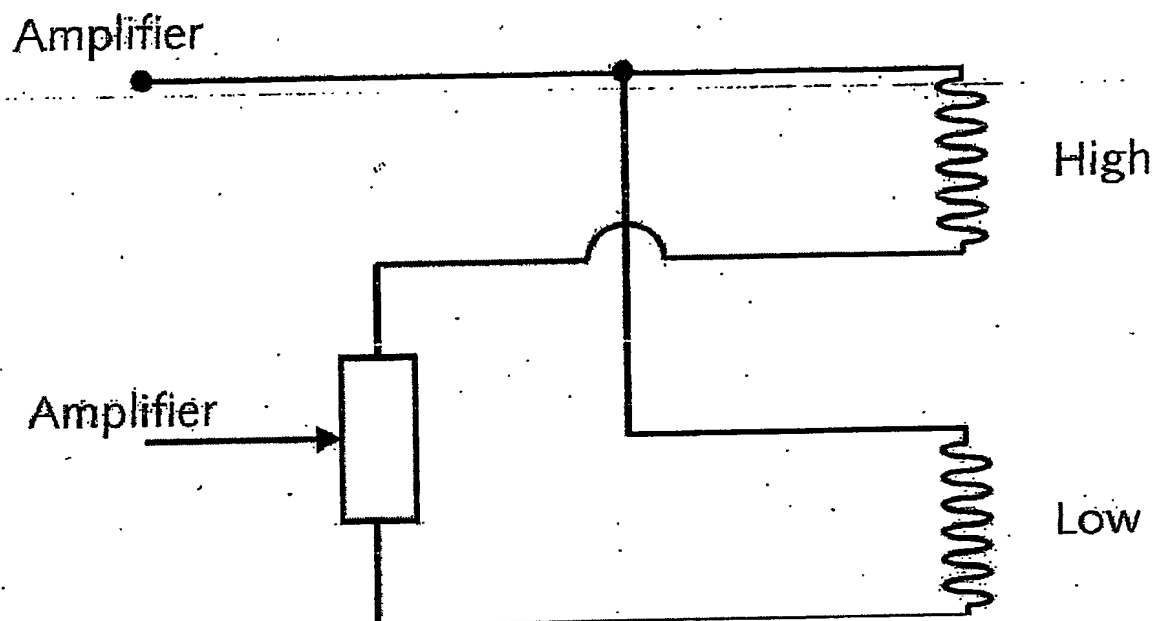


Fig 2

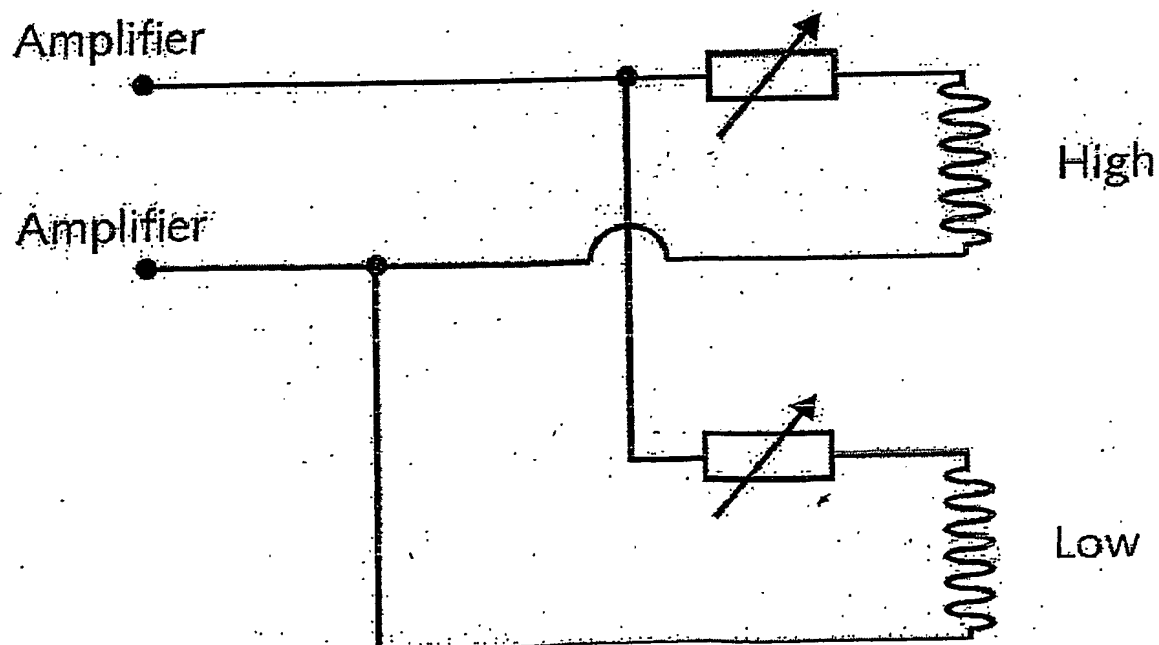


Fig 3
Amplifier

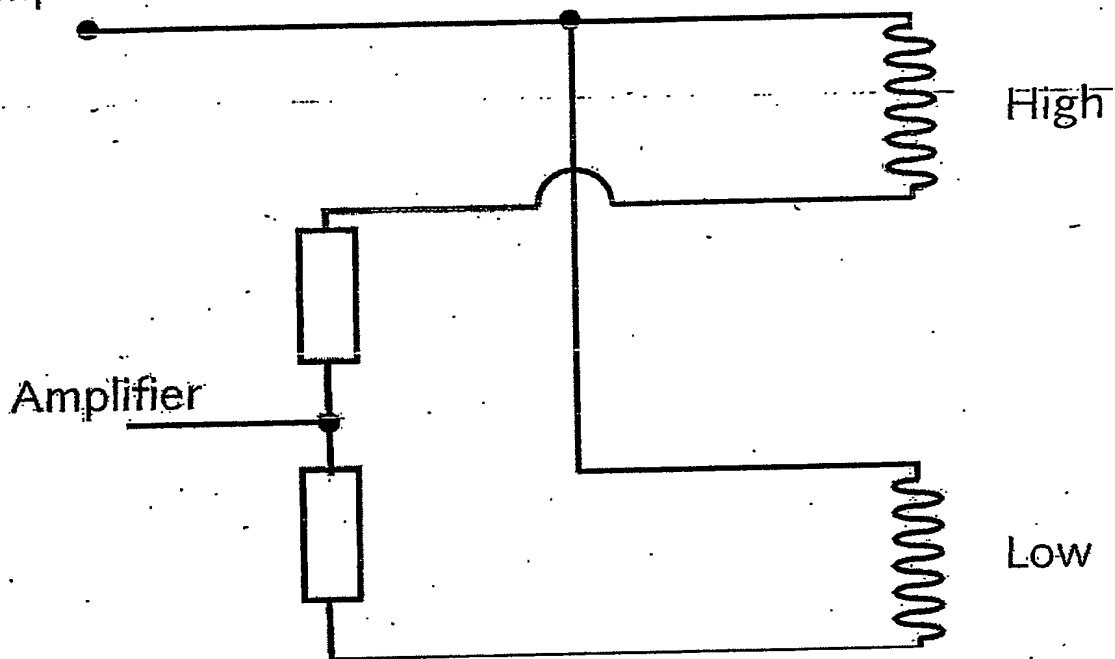


Fig 4.

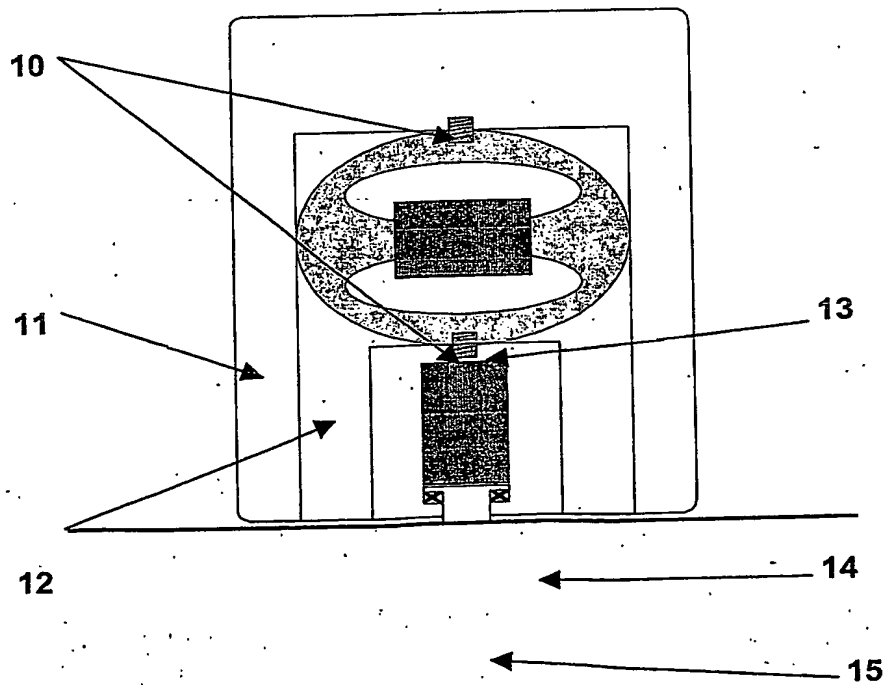


Fig 5.

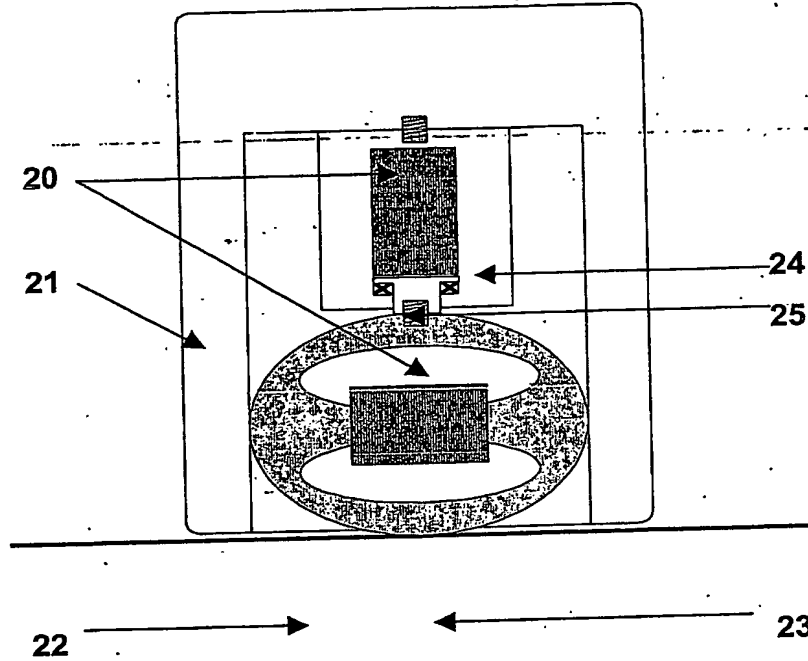


Fig 6.

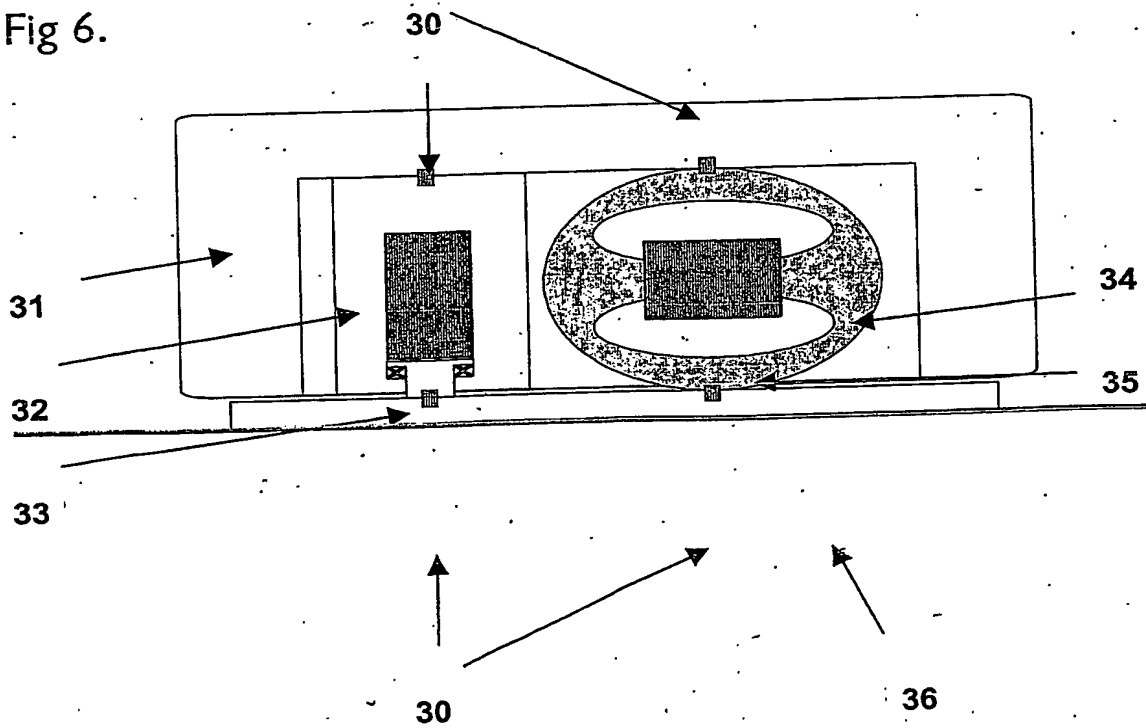
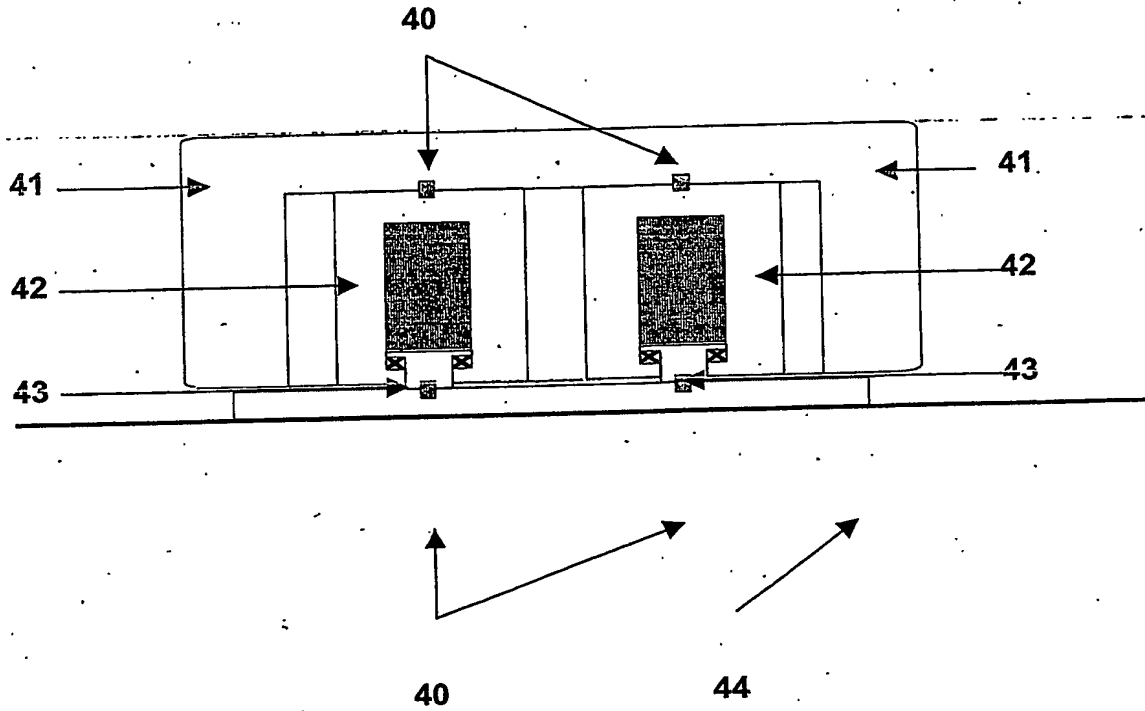


Fig 7



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